THE IDENTITY OF *CRACCA* BENTHAM (FABACEAE, ROBINIEAE) IN THE UNITED STATES

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ABSTRACT

The identity and circumscription of species of *Cracca* Bentham in the United States are confused in the literature. As clarified herein, two species of *Cracca,* **C. glabella** (Gray), comb. et stat. nov. and *C. sericea* (Gray) Gray, occur in the United States, where they are restricted to oak woodlands and associated grasslands of southeastern Arizona.

Cracca Bentham is composed of approximately 27 species found from sea level to high elevations along the Andean cordillera of northern Argentina to Colombia, in Central America, and through Mexico to the United States in southeastern Arizona. The genus includes large shrubs, subshrubs and herbaceous forms, and is closely allied to *Coursetia* DC.

The genus *Cracca* Bentham has been beset by much taxonomic and nomenclatural confusion since its erection by Bentham in 1854 (see Wood 1949 and White 1980). Unknown to Bentham, Linnaeus (1753) had also proposed a genus *Cracca,* comprising six species now included in *Tephrosia.* The work of Alefeld (1862) and subsequent work of Kuntze (1891) established *Cracca* Bentham as a later homonym. *Benthamantha* Alefeld was erected to include those species of *Cracca* Bentham, and *Cracca* L. was used to incorporate the species of *Tephrosia* Persoon. This latter arrangement was followed by botanists such as Rydberg (1924) during the early 1900s. Eventually, *Cracca* Bentham was conserved over *Cracca* L. (Taxon 8:293, 1959), and *Tephrosia* was reinstated to include Linnaeus's species of *Cracca.*

Compounding the nomenclatural problems is the fact that the species of *Tephrosia* Persoon and *Cracca* Bentham are superficially very similar, belonging to two closely related tribes, the Tephrosieae and Robinieae, respectively. Many species of *Cracca* Bentham are filed in herbaria under "barbistyled" *Tephrosia,* and various species of *Tephrosia* are filed under *Cracca.* Important morphological features that distinguish the two genera are summarized as follows:

Inflorescences of axillary racemes with 1 flower per node, never

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terminal; wing petals free from the keel; mature pod partitioned; leaflets stipellate, venation reticulate .. *Cracca* Bentham

Inflorescences of terminal and/or axillary pseudoracemes with 2–3 flowers per node; wing petals lightly adherent to the keel; mature pod not partitioned; leaflets not stipellate, venation penniparallel ..... *Tephrosia* Persoon

The two most important features distinguishing the two genera are the position of the inflorescence and the number of flowers per node. These are two important systematic characters that distinguish the tribe Tephrosieae from Robinieae.

The circumscription and nomenclature of the two species in the United States have also been unsettled since Gray (1853) described *Cracca edwardsii* from a plant collected "Near Monterey [sic], Mexico, Dr. Edwards, in herb. Torr." and from plants collected by Charles Wright in Arizona. The one species of *Cracca* that occurs naturally in the Monterrey area is identical to the lectotype (NY!, designated by Rydberg 1924) of *C. edwardsii* and belongs to a species complex confined to northeastern Mexico (Coahuila, San Luis Potosi, Tamaulipas, Veracruz and Hidalgo). It is quite distinct from the two species that occur in southern Arizona and northwestern Mexico. Gray, however, reported *C. edwardsii* from southern Arizona and northern Sonora, having confused Charles Wright's collection *963* (number assigned by Gray) with *C. edwardsii.* A further complication arose when Gray distributed Wright's collections because *Wright 963* actually consisted of two taxa of *Cracca,* neither of them *C. edwardsii.* Later, Gray (1882) rectified this oversight by describing the vars. *sericea* and *glabella* of *C. edwardsii,* but he lacked sufficient material to distinguish between the species of Arizona and Monterrey. As a result, the majority of the specimens of the genus *Cracca* from Arizona have the wrong name applied to them.

Rydberg (1924) treated the genus *Cracca* Bentham as *Benthamantha* Alefeld, a later synonym, and listed *Benthamantha wrightii, B. edwardsii,* and *B. glabella* from the United States. He treated *Cracca sericea* as a synonym of *C. edwardsii.*

Kearney and Peebles (1960) omitted *Cracca sericea* from their treatment. They listed *Cracca edwardsii* from Arizona and treated *C. glabella* as a variety of *C. edwardsii.* They also state that the two Arizona taxa intergrade with each other. Based on personal preliminary field and herbarium studies, this condition is not known to occur, and I am unaware of any definite references to intergradation between these taxa other than the vague one in Kearney and Peebles.

Wiggins (in Shreve and Wiggins 1964) also treated the genus *Cracca* Bentham as *Benthamantha* Alefeld. He did not mention *Cracca sericea* in the text but listed *B. edwardsii* and treated *B. glabella* as a variety of *B. edwardsii.*

More recently, Kartesz and Kartesz (1980) listed only *Cracca caribaea* from the United States; *C. glabella* and *C. sericea* were

omitted from their work altogether. *Cracca caribaea,* a widespread weed, is not known from the United States but gets as close as southern Tamaulipas and southern Baja California.

Actually, only *Cracca sericea* and *C. glabella* occur in the United States, where they are restricted to the pine-oak woodlands and associated grasslands of southeastern Arizona (Santa Rita Mts. to the Chiricahua Mts.). They are distinct species that do not intergrade and belong to two separate phyletic lines within the genus. *Cracca sericea* is closely allied to the widespread, lowland *C. caribaea* and belongs to a group of *Cracca* that has an erect habit, tap roots, and relatively few, large, elliptic leaflets. In fact, if it were not for the tannin deposits on the leaflets and racemes congested above the leafy portions of the plant, *C. sericea* would be almost indistinguishable from *C. caribaea.*

Cracca glabella, on the other hand, belongs to the *C. pumila* complex, which is centered at high elevations in the Transverse Volcanic Axis and the Sierra Madre Occidental of Mexico. This species complex is characterized by plants with a prostrate habit, fusiform tuberous roots, and many, small, oval leaflets. *Cracca glabella* is distinguished from *C. pumila* only by its larger, yellowish flower, sericeous ovary and different pattern of tannin deposits on the lower surface of the leaflets.

Cracca glabella is remarkable in that it is one of the few herbaceous species of the genus in Mexico that has developed showy corollas, a feature more characteristic of South American craccas. The species has large, yellow flowers, and a deep reddish, relatively long-tubed calyx. It has thickenings or protuberances at the base of the banner that appear to act as nectar-guides. The filament of the vexillary stamen is thickened and clasped by the well developed auricles of the basal portion of the staminal tube. *Cracca glabella* is thus quite distinctive compared to most other Mexican species of *Cracca,* which are predominantly self-fertile and have flowers that are inconspicuous and/or predominantly cleistogamous.

In essence, to regard these two taxa as synomymous, or as mere varieties, obscures or ignores phylogenetically important characters of the genus.

Cracca edwardsii, in contrast, is a small, erect subshrub with fusiform tuberous roots and leaves lacking tanning deposits. The inflorescences are reduced and do not overtop the leafy portion of the plant. Additionally, the flowers are very small, inconspicuous and cleistogamous. It inhabits dry, limestone foothills of the Sierra Madre Oriental.

Key to species of *Cracca* Bentham in the United States

Stems prostrate, decumbent; roots fusiform tuberous; leaflets ovate-elliptic, rounded at both ends, (9–)11–21 per leaf, largest leaf-

lets 7–15 × 4–7 mm, adaxial surface glabrate, rarely lightly sericeous, abaxial surface sericeous but with hairs restricted to leaf margins and main veins; abaxial calyx lobes at least 4 mm long; all petals yellow, banner commonly with a reddish mid-vein; ovary sericeous; leaflet tannin deposits (evident upon aging or drying) restricted to veins of abaxial surface; stipels minute, rarely to 1 mm ..... *C. glabella*

Stems erect, from a taproot, roots not tuberous; leaflets elliptic, acute at both ends, 7–13 per leaf, largest leaflet 14–28 × 6–14 mm, adaxial surface evenly sericeous, occasionally glabrate in older leaves, abaxial surface evenly to densely sericeous; abaxial calyx lobe to 3.5 mm long; banner reddish-pink, whitish at base, wings and keel whitish; ovary glabrous, granuliferous; leaflet tannin deposits (evident upon aging or drying) restricted to the center of the leaflet on the abaxial surface; stipels 0.5–1.5 mm long, rarely minute ..... *C. sericea*

Cracca glabella (Gray) Lavin, comb. et stat. nov.—*Cracca edwardsii* Gray var. *glabella* Gray, Proc. Am. Acad. Arts 17:201, 1882.—*Benthamatha grayi* Alefeld var. *glabella* (Gray) Britton & Baker, J. Bot. 38:19, 1900.—*Benthamantha glabella* (Gray) Rydb., North American Flora 24:247, 1924.—*Benthamantha edwardsii* (Gray) Rose var. *glabella* (Gray) Wiggins, Veg. and Flora Sonoran Desert. Vol. 1:690, 1964.—TYPE: hills between the Barbocomori and Santa Cruz [the Huachuca Mts., Arizona], 23 Sep, 1851. *C. Wright 963* p.p. Lectotype (designated by Rydberg 1924): US!; isotypes: MO! NY! UC! US!.

Cracca glabella is restricted to pine and pine-oak forests at high elevations (2000–2200 m) in the Huachuca (Lanner and Garden Canyons), Chiricahua (Rucker Valley) and Patagonia Mountains of southeastern Arizona and the Sierra Madre of west-central Chihuahua. It flowers from July through September. Only five collections of *Cracca glabella* are known from Arizona; the most recent collection is from 1928. It may have been eliminated from the Arizona flora by overgrazing. Based on preliminary investigations, the genus is very sensitive to the pressures of grazing.

Gray (1853), in his original description of *Cracca edwardsii,* stated that the collections made by Wright were from "Valleys in the mountains between the San Pedro and the Sonoita, Sonora (in flower and with young fruit); and on hills between the Barbocomori and Santa Cruz (with ripe pods): Sept. (963)." The collection "in flower and with young fruit" is of *Cracca sericea,* whereas the collection "with ripe pods" is of *C. glabella.* Wright's collection numbers, for what were obviously two separate collections, were discarded by Gray, who distributed both collections under a new number, *963.* This practice has been documented by McKelvey (1955) and Johnston (1940):

> Not only did Gray ignore Wright's field-numbers but he also frequently united and distributed under a single distribution number, two or even more collections which Wright had collected under different field-numbers, frequently at distant stations and at different seasons. If Gray thought two or more of Wright's collections represented the same species and if there was any advantage in uniting them, he did so regularly without scruples.

Cracca glabella was first collected in September, 1851 by Charles Wright (no. *963*) in southeastern Arizona. Gray (1882), in his original description, cited one additional collection by Lemmon in 1881. Although Wright's collection consists of both *C. glabella* and *C. sericea,* Rydberg (1924) indicated the collections of Wright as type for *C. glabella* when he stated the type locality to be "hills between the Barbocomori [Arizona] and Santa Cruz, Sonora." This is the same locality that Gray (1853) indicated the plants to have ripe pods, and these plants correspond precisely with *C. glabella* in the mixed Wright collection *963.*

The exact locality at which Wright first collected *C. glabella* can be deduced from the protologue combined with Wright's field notes. It was most likely collected on 23 September 1851, as Wright went around the north end of the Huachuca Mountains, leaving the Barbocomori River drainage and starting down into that of the Santa Cruz River. Johnston (1940) says that Wright's collections dated September 23 were probably all collected before he reached Santa Cruz and probably all from within present day Santa Cruz County, Arizona. This is supported by the herbarium record, which documents *C. glabella* as occurring only at relatively high elevations in southeast Arizona and west-central Chihuahua. Suitable habitats are missing in Sonora near Santa Cruz.

Cracca sericea (Gray) Gray, Proc. Am. Acad. Arts 19:74 (1883) 1884. —*Cracca edwardsii* Gray var. *sericea* Gray, Proc. Am. Acad. Arts 17:201, 1882.—*Brittonamra sericea* (Gray) Kearney, Trans. N.Y. Acad. Sci. 14:32, 1894.—*Benthamantha sericea* (Gray) Britton & Baker, J. Bot. 38:19, 1900.—TYPE: Santa Rita Mts., Arizona, 6 May, 1881. *C. G. Pringle 292.* Lectotype (here designated): GH!; isotypes: F! NY!.

Benthamantha wrightii Rydberg, North American Flora 24:246, 1924. TYPE: between San Pedro River and the Sonoita [River, east side of the Huachuca Mts., Arizona]. *C. Wright 963* p.p. Holotype NY!; isotypes: UC! US!.

Cracca sericea inhabits moderate elevations (1300–1900 m) in southeastern Arizona, northeastern Sonora, central and western Chihuahua, and northern Sinaloa and Durango. It flowers from July to September and occasionally in the spring (March through May) dur-

ing wet years. One of the more abundant species of *Cracca, C. sericea* is a conspicuous understory member of oak woodlands and associated grasslands of this area and, in typical form, has conspicuous reddish-flowered racemes that overtop the leaves. Tannins, which are evident on the older leaflets and dried herbarium specimens, are deposited centrally in each leaflet, a pattern unique to this species.

Cracca sericea was first collected, along with *C. glabella,* by Charles Wright (no. *963*) in September, 1851, in southeastern Arizona. Gray included these combined collections as syntypes of *C. edwardsii* in his original description of that species. Thirty years later, Gray (1882) recognized that some of the Arizona collections were different from the type of *C. edwardsii* and named these var. *sericea* and var. *glabella.* Later, Gray (1884) raised var. *sericea* to the species rank as more collections became available for comparison.

Gray (1882) based var. *sericea* on *Pringle 292* from the Santa Rita Mts. and *Lemmon "136 & 588"* from Spring Creek Canyon of the Santa Catalina Mts. The latter collection consists of a single sheet and although Rydberg designated (on the herbarium sheet) *Lemmon "136 & 588"* as type of *C. edwardsii* var. *sericea,* an account was never so published. The sheets of *Pringle 292* are a bit more numerous and the specimen at GH is annotated by Gray. This collection is, therefore, designated as the type.

Rydberg (1924) also based *Benthamantha* (=*Cracca* Bentham) *wrightii* on *Wright 963.* The collection, as mentioned earlier, contains two distinct species. Rydberg expressly distinguished between the two on the pertinent sheets and his intention, therefore, is obvious. His designation of the type locality is that given by Gray (1853), but one qualification is needed here. Gray understood this locality to be between the "San Pedro" and the "Sonoita" in Sonora. The "Sonoita" Wright referred to is a river that drains the east slope of the Huachuca Mts. (Johnson 1940). If Wright's path is retraced, the locale between the San Pedro River and the Sonoita River lies roughly near the northeast end of the Huachuca Mts. in Arizona. It is possible to narrow the collections down to three of Wright's collection numbers, but as with *Cracca glabella,* the real collection number may never be known.

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